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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/522,274	09/02/2005	Bradley P Russell	HYI-02-102	8791

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EXAMINER	
NGUYEN, HUY TRAM	
ART UNIT	PAPER NUMBER
1797	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/522,274	RUSSELL ET AL.	
	Examiner	Art Unit	
	Huy-Tram Nguyen	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 September 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 January 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *See Continuation Sheet*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :September 2, 2005 and April 17, 2006.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 9-15 are rejected under 35 U.S.C. 102(e) as being anticipated by **Skala et al. (US 2002/0094461 A1).**

Regarding Claim 9, Skala et al. reference discloses a process for changing the rate of hydrogen production by a hydrogen generator by changing the feed rates of externally-provided raw materials into the hydrogen generator, said materials comprising fuel, oxygen-containing gas, and water, whereby fuel is reformed at elevated temperature in the presence of steam to produce a reformate containing hydrogen, carbon monoxide and carbon dioxide, and carbon monoxide contained in the reformate is converted to carbon dioxide said process having a transition rate-limiting operation **(Page 1, Paragraph [0004])**, the improvement comprising controlling the rate of change of the feed rate of each of the externally-provided raw materials in accordance with a predetermined rate commensurate with the rate of change in the transition rate-limiting operation **(Page 3 & 4, Paragraph [0030])**.

Regarding Claim 10, Skala et al. reference discloses the process of claim 9 wherein the hydrogen generator provides hydrogen to a fuel cell to generate electricity over a range of electricity production rates and the hydrogen production rate is established by the electricity production rate (**Page 1, Paragraph [0001] & [0002]).**

Regarding Claim 11, Skala et al. reference discloses a process for transitioning during a transition period a hydrogen generator in which reforming a fuel is reformed in the presence of steam to produce a reformate containing hydrogen and carbon oxides including carbon monoxide and carbon monoxide in the reformate is converted to carbon dioxide to provide a hydrogen product **(Page 1, Paragraph [0004])**, from a first hydrogen product rate having a first steady state operating condition including a ratio of at least one externally provided raw material to fuel, to a second hydrogen product rate having a second steady state operating condition including the ratio of said at least one externally provided raw material to fuel, the improvement comprising providing the ratio of said at least one externally provided raw material to fuel at a value different than such ratios at the steady state condition for the first hydrogen product rate and at the steady state condition for the second hydrogen product rate for at least a portion of the transition period to enhance the transition **(Page 3 & 4, Paragraph [0030])**.

Regarding Claim 12, Skala et al. reference discloses the process of claim 11 wherein the at least one externally provided raw material comprises water for reforming **(Page 3, Paragraph [0024] – water stream (14)).**

Regarding Claim 13, Skala et al. reference discloses the process of claim 12 wherein at least a portion of the conversion of carbon monoxide to carbon dioxide is

effected by preferential oxidation in the presence of free oxygen, and the at least one externally provided raw material comprises free oxygen for the preferential oxidation **(Page 3, Paragraph [0027]).**

Regarding Claims 14 and 15, Skala et al. reference discloses the process of claim 12 wherein the ratio of said at least one externally provided raw material to fuel is sufficient and is maintained for a sufficient portion of the transition period to accommodate slower responding conditions and to attenuate adverse transient responses **(Page 3, Paragraphs [0025] & [0029]).**

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kuipers et al. (WO 01/16022 - using US Patent No. 6,852,307 B1 as equivalent document) in view of Acker (US Patent No. 6,322,917 B1).**

Regarding Claim 1, Kuipers et al. reference discloses a process for operating a hydrogen generator having a variable hydrogen production rate output **(Column 1, Lines 28-33).**

The improvement comprising

a) determining the condition of the hydrogen generator and the condition of the hydrocarbon-containing feed **(Column 2, Lines 54-59 – amount of fuel needed per unit of time, flow rate of the fuel, hydrogen demand)**,

b) electing predetermined feed rates for the externally-provided raw materials based upon the determined condition of the hydrogen generator and the condition of the hydrocarbon-containing feed **(Column 2, Lines 46-49)**, and

c) controlling the feed rate of each of the externally-provided raw materials to substantially the selected predetermined feed rates **(Column 2, Lines 50-53 – adjusting means (4) and (5) which control the flow rates of the reactants).**

However, the hydrogen generator of Kuipers et al. is using a catalytic oxidation process in which the raw materials do not comprise water. Acker reference discloses the claimed hydrogen generator comprising a reformer (3), a Shift reactor (40) and a PROX reactor (50) with the raw materials of hydrocarbon fuel (120), steam (130) and air (140) **(Column 6, Lines 14-43)**. It would have been obvious to one having ordinary skill in the art at the time the invention was made to the hydrogen generator as taught by Acker, since Acker reference states at Column 6, Lines 39-42 that such a modification would reduce the level of carbon monoxide in the reformed fuel mixture to below 5-100ppm.

Regarding Claim 2, Kuipers et al. and Acker references disclose the process of claim 1 wherein the hydrogen generator provides hydrogen to a fuel cell to generate electricity over a range of electricity production rates and the hydrogen production rate is established by the demand for hydrogen by the fuel cell **(Kuipers et al. - Column 6, Lines 56-61).**

Regarding Claim 3, Kuipers et al. and Acker references disclose the process of claim 1 wherein the predetermined rate of each of the externally- provided raw materials being defined by a bank of values specific to the hydrogen production rate for the condition of the hydrogen generator and the condition of the hydrocarbon-containing feed **(Column 2, Lines 56-59).**

Regarding Claim 4, Kuipers et al. and Acker references disclose the process of claim 3 wherein the condition of the hydrogen generator is ascertained by monitoring operating conditions **(Column 3, Lines 3-10).**

Regarding Claim 5, Kuipers et al. and Acker references disclose the process of claim 4 wherein cascade control based upon monitoring operating conditions establishes the bank of values of the predetermined rates specific to the hydrogen production rate **(Kuipers et al. - Column 3, Lines 21-25).**

Regarding Claim 6, Kuipers et al. reference discloses the process of claim 1 except for the predetermined rate of each of the externally- provided raw materials is established by an algorithm specific to the hydrogen production rate and the condition of the hydrogen generator and the condition of the hydrocarbon-containing feed. Acker reference discloses an algorithm stored in a controller for using in process of producing hydrogen for fuel cell **(Column 5, Lines 49-54)**. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the algorithm as taught by Acker since it was known in the art to use a computable set of steps to achieve a desired result.

Regarding Claim 7, Kuipers et al. and Acker references disclose the process of claim 6 wherein the operating condition of the hydrogen generator is ascertained by monitoring operating conditions **(Column 3, Lines 3-10).**

Regarding Claim 8, Kuipers et al. and Acker references disclose the process of claim 7 wherein cascade control based upon monitoring operating conditions establishes the algorithm for the predetermined rates specific to the hydrogen production rate **(Kuipers et al. - Column 3, Lines 21-25).**

Claims 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Acker (US Patent No. 6,322,917 B1).**

Regarding Claim 16, Acker reference discloses a method for maintaining low levels of carbon monoxide in a hydrogen fuel processor (Figure 1, numeral 20) with series of throttle valves and blowers, a controller (110) monitoring power demand, a look-up table for determine the optimum air flow rate. However, Acker does not expressly discloses a process wherein said water being added to the hydrocarbon fuel prior to said hydrocarbon fuel entering said reactor, and wherein air is added to said at least one preferential oxidation reactor in accordance with said algorithm, wherein said algorithm comprises determining a 30 target hydrocarbon fuel flow 03) and a current hydrocarbon fuel flow (A), then determining a present difference (D) = (B)-(A), and then comparing said difference (D) with a predetermined threshold value to determine whether said fuel processor is turning up production of hydrogen, turning down production of hydrogen or operating at a steady state mode and wherein a higher ratio of water to fuel and air to fuel is added when said fuel processor is turning up production for a preset period of time than when said fuel processor is operating at a steady state mode and wherein a lower ratio of water to fuel and air to fuel is added when said fuel processor is in a turning down of production mode.

However, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the algorithm disclosed in Acker to determine a target hydrocarbon fuel flow and current flow rate and from that determine whether a higher or lower ratio of water/fuel and air/fuel needs to use during the transient condition and a steady state mode **(Column 9,Lines 15-31),** as such a modification is a result effective variable, where one skilled in the art would recognize to optimize a process variable by

routine experimentation, as in this case, to use hydrocarbon flow to determine hydrogen turn up, turn down or steady state. See In re Boesch, 617 F.2d 272, 276 (CCPA 1980); (MPEP 2144.05).

Regarding claim 17, Acker reference discloses further discloses that the CPU may run a calibration routine at specific times. It would have been obvious to one of ordinary skill in the art at the-time of the invention to modify the CPU and algorithm to measure the target hydrocarbon fuel flow and current fuel flow periodically and calculate the difference to determine whether to increase, decrease or not change the water/fuel and air/fuel ratios, for the purpose to reduce CO levels in order to not poison the fuel cell catalyst **(Column 3, Lines 50-54).**

Regarding claim 18, Acker further discloses that the CPU changes the air flow rates (and hydrocarbon rates) at a rate slower than the fuel cell response time, therefore indicating a delay prior to commencement of the predetermined ratio for the steady state mode **(Column 8, Lines 1-10).**

Regarding claim 19, Acker reference discloses the method of claim 16 except for the fuel processor containing at least two preferential oxidation reactors. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Acker to include at least two PROX reactors where equal flow of air is added to each reactor for the purpose to increase production of the hydrogen stream. This modification is a mere duplication of parts and would be known to one of ordinary skill in the art at the time of the invention. See In re Harza, 274 F.2d 669, 124 USPQ 378 (CCPA 1960)

Regarding claim 20, Acker discloses the process would yield hydrogen fuel mixture to below 50-100 ppm **(Column 6,Lines 40-43).**

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Huy-Tram Nguyen whose telephone number is 571-270-3167. The examiner can normally be reached on MON- THURS: 6:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

HTN
12/14/07

WALTER D. GRIFFIN
SUPERVISORY PATENT EXAMINER